jc803 U.S. PTO
10/12/00

LAW OFFICES
SUGHRUE, MION, ZINN, MACPEAK & SEAS, PLLC
2100 PENNSYLVANIA AVENUE, N.W.
WASHINGTON, DC 20037-3213
TELEPHONE (202) 293-7060
FACSIMILE (202) 293-7860
www.sughrue.com

jc916 U.S. PTO
09/686618
10/12/00

October 12, 2000

BOX PATENT APPLICATION
Assistant Commissioner for Patents
Washington, D.C. 20231

Re: Application of Yoshiaki INOUE
APPARATUS FOR AND METHOD OF OUTPUTTING IMAGE
Our Ref. Q58056

Dear Sir:

Attached hereto is the application identified above including 36 sheets of the specification, claims, 14 sheet(s) of formal drawings, executed Assignment and PTO 1595 form, and executed Declaration and Power of Attorney. Also enclosed is the Information Disclosure Statement and PTO form 1449, and Priority document.

The Government filing fee is calculated as follows:

Total claims	14	-	20	=		x	$18.00	= $.00
Independent claims	2	-	3	=		x	$80.00	= $.00
Base Fee								$710.00
TOTAL FILING FEE								**$710.00**
Recordation of Assignment								$40.00
TOTAL FEE								**$750.00**

Checks for the statutory filing fee of $710.00 and Assignment recordation fee of $40.00 are attached. You are also directed and authorized to charge or credit any difference or overpayment to Deposit Account No. 19-4880. The Commissioner is hereby authorized to charge any fees under 37 C.F.R. §§ 1.16 and 1.17 and any petitions for extension of time under 37 C.F.R. § 1.136 which may be required during the entire pendency of the application to Deposit Account No. 19-4880. A duplicate copy of this transmittal letter is attached.

Priority is claimed from October 14, 1999 based on JP Application No. 11-292086. The priority document is enclosed herewith.

Respectfully submitted,
SUGHRUE, MION, ZINN,
MACPEAK & SEAS, PLLC
Attorneys for Applicant

By: _____
Darryl Mexic
Registration No. 23,063

DM/slb

APPARATUS FOR AND METHOD OF OUTPUTTING IMAGE

BACKGROUND OF THE INVENTION

Field of the Invention:

The present invention relates to an apparatus for and a method of outputting an image, which are preferably applicable to a raster image processor, for use in a CTP (Computer To Plate) device or a CTC (Computer To Cylinder) device, for converting digital image data having values ranging from 0 to 255 into binary or four-valued digital image data based on which an image is recorded according to a scanning recording process.

Description of the Related Art:

In printing and platemaking fields, it has heretofore been customary to produce printing plates for use on printing presses with a contact printer. In recent years, efforts are being made to carry out a printing process including the production of printing plates based on digital signal processing.

It is necessary in the art of printing and platemaking that the colors of a print sample and the colors (hues) of a print produced by a printing press be equal to each other.

In the conventional printing process of producing films from a platemaking process, producing printing plates from the films, and then producing a print from the printing plates on a printing press, if the colors of the print produced by the printing press do no agree with the colors of a

print sample, then the operator first attempts to adjust the amounts of inks on the printing plates on the printing press which are usually a C (cyan) plate, an M (magenta) plate, a Y (yellow) plate, and a K (black) plate.

If the first attempt fails to achieve desired color matching, then the operator produces printing plates again to obtain adjusted hues. Specifically, films are placed in contact with printing plates in a contact printer, and the printing plates are exposed to ultraviolet rays through the films for certain exposure times. At this time, the exposure times are adjusted to change respective exposure levels of the C, M, Y, K plates for thereby changing gradations, so that the hues of the entire print can be adjusted. Heretofore, the exposure times are adjusted to change exposure levels (light intensities × times) in various stages, e.g., three stages, five stages, six stages, etc.

According to a recent new process which employs a CTP device with an ancillary raster image processor (hereinafter also referred to as "RIP"), the CTP device can produce exposed printing plates directly when it is supplied with digital image data having values ranging from 0 to 255.

However, the RIP associated with the CTP device does not have any means for easily changing the gradation characteristics of entire printing plates by changing exposure levels. In order to change the gradations of entire printing plates, it is necessary for the operator to go back to the process of producing digital image data to produce cor-

rected digital image data.

Usually, the operator who works with the CTP device is often not skilled enough to produce digital image data on a workstation or the like, which is used to produce digital image data, and finds it time-consuming to produce corrected digital image data.

Another problem is that thanks to the advance of the network technology, the CTP device or a site where the CTP device is installed is often physically spaced apart from a site where digital image data is produced, so that it is actually difficult for the operator to go back to the process of producing digital image data to correct digital image data for changing overall gradations.

There has been proposed a technique for correcting gradations for the purpose of correcting the dot gain for printing in the RIP. According to the proposed technique, a printed material having patches representing overall gradations divided in 10 stages as a test chart, and the read values of halftone % of the patches on the test chart are supplied to the RIP to correct the dot gain thereof. However, such a process is considerably complex and time-consuming. While the proposed technique makes it possible for the operator to take time to adjust the RIP at the time the CTP device is installed, it cannot correct the hues of images readily in routine work.

SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide an apparatus for and a method of outputting an image by readily correcting the hues of an image, i.e., correcting the gradations of printing plates, in a process of producing the printing plates without going back to a prior process in a digital printing process which employs a CTP device or a CTC device.

According to the present invention, there is provided an apparatus for outputting an image by generating at least one of a print, a print proof, a printing plate, and a platemaking film directly from image data including at least one color element, comprising preparing means for preparing a plurality of gradation conversion curves whose gradation characteristics are different stepwise from each other, selecting means for selecting one of the gradation conversion curves with respect to at least one color element, and gradation converting means for being supplied with image data, converting gradations of the supplied image data according to the selected gradation conversion curve, and outputting image data represented by the image data with the corrected gradations.

The preparing means prepares a plurality of gradation conversion curves whose gradation characteristics are different stepwise from each other. The selecting means selects one of the gradation conversion curves with respect to at least one color element, and sets the selected gradation conversion curve in the gradation converting means. The

gradation converting means can convert gradations of the image data including at least one color element according to the gradation conversion curve which has been set, and output image data represented by the image data with the corrected gradations.

The preparing means may comprise storing means for storing the gradation conversion curves whose gradation characteristics are different stepwise from each other. Since a desired gradation conversion curve can immediately be selected from the storing means, the output image data can quickly be obtained.

The preparing means may comprise generating means for generating the gradation conversion curves whose gradation characteristics are different stepwise from each other. Therefore, the output image data can be obtained using any desired gradation conversion curve.

Each of the gradation conversion curves may have gradation changes which correspond to exposure levels in a contact exposure process for producing printing plates. Therefore, the operator who is accustomed to a conventional process of producing printing plates can convert gradations definitely without any significant organoleptic operation failures.

Specifically, each of the gradation conversion curves which has the gradation changes which correspond to the exposure levels may be indicated by a title corresponding to one of the exposure levels. Thus, a gradation conversion

curve corresponding to a desired exposure level can uniquely be selected.

The gradation conversion curves whose gradation characteristics are different stepwise from each other may comprise a plurality of gradation conversion curves whose gradation characteristics are different stepwise from each other only in a highlight area, a middle-tone area, or a shadow area. Therefore, not only overall gradations can be adjusted, but also partial gradations in the highlight area, the middle-tone area, or the shadow area can be adjusted.

The apparatus may further include gradation conversion curve generating/correcting means for newly generating or correcting the gradation conversion curves. Consequently, a desired gradation conversion curve can easily be obtained.

The apparatus may further include display means for simultaneously displaying the gradation conversion curves. The user can select a desired gradation conversion curve visually with ease.

According to the present invention, there is also provided a method of outputting an image by generating at least one of a print, a print proof, a printing plate, and a platemaking film directly from image data including at least one color element, comprising the steps of preparing a plurality of gradation conversion curves whose gradation characteristics are different stepwise from each other, selecting one of the gradation conversion curves with respect to at least one color element, and converting gradations of

supplied image data according to the selected gradation conversion curve, and outputting image data represented by the image data with the corrected gradations.

In the preparing step, a plurality of gradation conversion curves whose gradation characteristics are different stepwise from each other are prepared. In the selecting step, one of the gradation conversion curves is selected with respect to at least one color element. In the gradation converting step, gradations of the image data including at least one color element are converted according to the gradation conversion curve which has been selected, and image data represented by the image data with the corrected gradations is outputted. In this manner, desired output image data can easily be obtained.

The preparing step may comprise the step of storing the gradation conversion curves whose gradation characteristics are different stepwise from each other. Since a desired gradation conversion curve can immediately be selected from the stored gradation conversion curves, the output image data can quickly be obtained.

The preparing step may comprise the step of generating the gradation conversion curves whose gradation characteristics are different stepwise from each other. Therefore, the output image data can be obtained using any desired gradation conversion curve.

The above and other objects, features, and advantages of the present invention will become more apparent from the

following description when taken in conjunction with the accompanying drawings in which preferred embodiments of the present invention are shown by way of illustrative example.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a block diagram of an image outputting apparatus according to the present invention;

FIG. 2 is a block diagram of a gradation converting and binarizing device in the image outputting apparatus shown in FIG. 1;

FIG. 3 shows, by way of example, a displayed view having a gradation conversion curve displaying area and a gradation conversion curve setting displaying area;

FIG. 4 shows, by way of example, a displayed view in which a desired gradation conversion curve has been selected and set;

FIG. 5 is a block diagram of an alternative gradation converting and binarizing device for the image outputting apparatus shown in FIG. 1;

FIG. 6 shows, by way of example, another displayed view having a gradation conversion curve displaying area and a gradation conversion curve setting displaying area;

FIG. 7 shows, by way of example, still another displayed view having gradation conversion curve displaying areas and gradation conversion curve setting displaying areas;

FIG. 8 is a view showing displayed binary images;

FIG. 9 is a view of a displayed control point/

setting value display image for use in generating and correcting gradation conversion curves;

FIG. 10 is a diagram illustrative of the generation of a gradation conversion curve passing through setting values;

FIG. 11 is a diagram illustrative of the generation of a plurality of gradation conversion curves;

FIG. 12 is a diagram illustrative of another example of the generation of a gradation conversion curve;

FIG. 13 is a diagram illustrative of still another example of the generation of a gradation conversion curve; and

FIG. 14 is a flowchart of a processing sequence of the image outputting apparatus.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 shows a basic arrangement of an image outputting apparatus 10 according to the present invention.

As shown in FIG. 1, the image outputting apparatus 10 comprises a gradation converting and binarizing device 12 including a raster image processor (RIP) for converting the gradations of supplied C, M, Y, K digital image data G and converting the C, M, Y, K digital image data into binary image data H for each of C, M, Y, K printing plates, and a CTP device 14 connected to the gradation converting and binarizing device 12 for outputting C, M, Y, K printing plates PP based on the binary image data H.

Even when the image outputting apparatus 10 is supplied with digital image data G of one of the colors C, M, Y, K,

the image outputting apparatus 10 outputs binary image data H corresponding to the digital image data G of that one of the colors C, M, Y, K.

The C, M, Y, K digital image data G comprise digital image data G for the respective C, M, Y, K printing plates, having values ranging from 0 to 255, for example, which are generated by an editing workstation (not shown) or the like.

The image outputting apparatus 10, which basically comprises a computer, is capable of generating printing plates PP directly from the supplied digital image data G. The present invention is not limited to the image outputting apparatus 10 shown in FIG. 1, but is applicable to a CTC device for producing a print directly from digital image data including one or more color elements, a DDCP (Direct Digital Color Proof) device for producing a color proof directly from such digital image data, or a film setter for producing a platemaking film directly from such digital image data.

The CTP device 14 is a device for outputting printing plates PP by scanning plates with a laser beam that is turned on and off by the binary image data H, which is scanning image data, to recording images on the plates.

FIG. 2 shows in detail the gradation converting and binarizing device 12 in the image outputting apparatus 10 shown in FIG. 1.

The gradation converting and binarizing device 12 has a gradation conversion curve saving unit 22 as a storing means for storing data of a plurality of gradation conversion cur-

ves whose gradation characteristics are different stepwise from each other, and a gradation conversion curve selecting means 24 functioning as a selecting means for selecting a desired one of the gradation conversion curves stored in the gradation conversion curve saving unit 22 with respect to at least one color element of the colors C, M, Y, K, and also functioning as an image display assisting unit for displaying images represented by image data G, Ga, H.

The gradation converting and binarizing device 12 also has an LUT (Look Up Table) converter 26 as a gradation converting means for setting therein the selected one of the gradation conversion curves. The LUT converter 26 outputs digital image data Ga which is produced by converting the gradations of the supplied digital image data G with the selected gradation conversion curve.

The gradation converting and binarizing device 12 further includes a binarizing unit 30 for comparing the gradation-converted digital image data Ga outputted from the LUT converter 26 with threshold data (threshold matrix) T (T = 1, 2, ···, 255) read from a threshold saving unit 28, and outputting binary image data H which has a value 0 (non-blackened) when Ga < T and a value 1 (blackened) when Ga $\geqq$ T.

The user of the image outputting apparatus 10 can select threshold data T having a desired screen ruling and angle with the gradation conversion curve selecting means 24.

The CTP device 14 outputs C, M, Y, K printing plates PP

which bears images, e.g., halftone dot images, corresponding to the binary image data H outputted from the binarizing unit 30.

The gradation conversion curve selecting means 24 has a processing/determining unit 32 incorporating a GUI (Graphical User Interface). To the processing/determining unit 32, there are connected a keyboard/mouse (keyboard and/or mouse) 34 as an input means and a display unit 36 as a display means for simultaneously displaying a plurality of gradation conversion curves stored in the gradation conversion curve saving unit 22.

The display unit 36 can display images represented by the digital image data G, Ga and images represented by the binary image data H under the control of the processing/determining unit 32.

The image outputting apparatus 10 is basically constructed as described above. Operation of the image outputting apparatus 10 will be described below.

When the image outputting apparatus 10 is turned on and the user selects a gradation conversion mode with the keyboard/mouse 34, the processing/determining unit 32 simultaneously displays a plurality of gradation conversion curves stored in the gradation conversion curve saving unit 22 on the display unit 36.

FIG. 3 shows an initial state of a displayed view 50 on the display unit 36. The displayed view 50 comprises a gradation conversion curve displaying area 52 for displaying a

plurality of gradation conversion curves and a gradation conversion curve setting displaying area 54 for displaying settings of a selected gradation conversion curve.

The gradation conversion curve displaying area 52 displays seven different gradation conversion curves whose gradation characteristics are indicated respectively by "-3", "-2", "-1", "0", "+1", "+2", "+3". Each of the gradation conversion curves is a curve for converting values of input image data G (input values) into values of output image data Ga (output values) with the LUT converter 26.

If each of the gradation conversion curves is expressed by a function $y = x + f(x)$ where x represents an input value and y represents an output value, then the function f(x) of each of the gradation conversion curves can be expressed by a quartic function $f(x) = ax^4 + bx^3 + cx$.

The input image data G and the output image data Ga in the gradation conversion curve displaying area 52 shown in FIG. 3 have respective full scales represented by standardized values which range from a value 0 (corresponding to G = Ga = 0) to a value 1 (corresponding to G = Ga = 255) or halftone dot percent values which range from a value 0 % (corresponding to G = Ga = 0) to a value 100 % (corresponding to G = Ga = 255). The full scales can also be displayed with gradation values ranging from 0 to 255.

The gradation conversion curve setting displaying area 54 shown in FIG. 3 displays color elements "Y", "M", "C", "K", and gradation conversion curve setting boxes 61, 62,

63, 64 for displaying numbers (selected ones of the numbers -3, -2, -1, 0, +1, +2, +3) indicative of the gradation characteristics of the gradation conversion curves selected for the respective color elements "Y", "M", "C", "K". In the example shown in FIG. 3, all the gradation conversion curve setting boxes 61 - 64 display "0".

In order to change the value displayed in any one of the gradation conversion curve setting boxes 61, 62, 63, 64, the user places a mouse pointer MP on a desired one of these gradation conversion curve setting boxes 61, 62, 63, 64, and clicks the mouse 34, whereupon the display unit 36 displays a view for entering a desired number. Then, the user places the mouse pointer MP on a desired one of the gradation conversion curves having the gradation characteristics "-3", "-2", "-1", "0", "+1", "+2", "+3", and then clicks the mouse 34. Now, the number of the gradation characteristics of the selected gradation conversion curve is set in the desired one of the gradation conversion curve setting boxes 61 - 64.

FIG. 4 shows a displayed view 50a in which the number "+2" of the gradation characteristics of the gradation conversion curve for the magenta M is selected and set by the keyboard/mouse 34. After having selected and set the gradation conversion curves on the displayed view 50a, the user presses an execute key (not shown) on the keyboard/mouse 34. Look up tables corresponding to the gradation conversion curves (C = "0", M = "+2", Y = "0", K = "0") are successively read from the gradation conversion curve saving unit

22, and set in the LUT converter 26.

The LUT converter 26 successively converts the gradations of the supplied C, M, Y, K image data (input values) G according to the set gradation conversion curves, and outputs gradation-converted C, M, Y, K image data (output values) Ga. Specifically, the C image data Ga has been converted according to the gradation conversion curve (C = "0"), the M image data Ga has been converted according to the gradation conversion curve (M = "+2"), the Y image data Ga has been converted according to the gradation conversion curve (Y = "0"), and the K image data Ga has been converted according to the gradation conversion curve (K = "0").

The gradation-converted C, M, Y, K image data Ga are successively supplied to the binarizing unit 30, which outputs halftone dot image data as binary image data H to the CTP device 14.

Based on the binary image data H, the CTP device 14 outputs C, M, Y, K printing plates PP. For producing a print using the C, M, Y, K printing plates PP thus outputted, the M printing plate PP develops a volume greater by the gradation characteristics "+2", i.e., the M printing plate PP can carry more ink.

According to the above embodiment, as described above, in the digital printing process which employs the CTP device 14 (or a CTC device), the image outputting apparatus 10 allows the hues of an image, i.e., the gradations of printing plates, to be readily corrected in the process of producing

the printing plates PP without going back to a prior process simply by selecting gradation conversion curves displayed on the display unit 36.

Since the image outputting apparatus 10 generates printing plates PP again when it corrects the gradations, the user can adjust hues, which cannot fully be adjusted by adjusting the amounts of inks in the printing process, simply based on the GUI.

The image outputting apparatus 10 can correct gradations simply and flexibly to achieve a color match between the hues and the colors of a print sample under different conditions, i.e., when a different printing press is used, or a different printing plate material is used, a different ink or print paper is used, or printing plate materials, inks, and print papers differ from lot to lot.

The gradation converting and binarizing device 12 shown in FIG. 2 may be replaced with a gradation converting and binarizing device 12A shown in FIG. 5. Those of the gradation converting and binarizing device 12A shown in FIG. 5 which are identical to those of the gradation converting and binarizing device 12 shown in FIG. 2 are denoted by identical reference characters, and will not be described in detail below.

The gradation converting and binarizing device 12A shown in FIG. 5 does not have the LUT converter 26 of the gradation converting and binarizing device 12 shown in FIG. 2, and has a threshold saving unit 28A connected between the

binarizing unit 30 and the gradation conversion curve saving unit 22.

In the gradation converting and binarizing device 12A shown in FIG. 5, a gradation conversion curve selected by the gradation conversion curve selecting means 24 is incorporated in the threshold data T stored in the threshold saving unit 28A. In this manner, the binarizing unit 30 can perform a binarizing process including a gradation conversion process for generating binary image data H from digital image data G.

According to a process of incorporating a gradation conversion curve in the threshold data T, as disclosed in Japanese laid-open patent publication No. 8-98025, it is assumed that when the gradation conversion curve having the gradation characteristics "+2" (see FIG. 3) is selected, the gradation characteristics "+2" of this gradation conversion curve convert the gradations of input image data G = 127 into gradations that are 20 % greater, for example.

Specifically, the input image data G = 127 is converted into image data G = 152 ($\approx 127 \times 1.2$). For carrying out such conversion, of all the threshold data T ranging from 1 to 255 stored in the threshold saving unit 28A, threshold data T = T (1, 2, $\cdots$, 152) up to T = 152 may be converted into threshold data T = T (1, 2, $\cdots$, 127) up to T = 127. With the threshold data T thus converted, input image data G having a halftone dot % of 50 % is converted into output binary image data H having a halftone dot % of 60 %.

The image outputting apparatus 10 with the gradation converting and binarizing device 12A shown in FIG. 5 offers the same advantages as those of the image outputting apparatus 10 with the gradation converting and binarizing device 12 shown in FIG. 2.

FIG. 6 shows another displayed view 50b on the display unit 36. The displayed view 50b comprises a gradation conversion curve displaying area 52b and a gradation conversion curve setting displaying area 54b. The gradation conversion curve displaying area 52b displays a plurality of gradation conversion curves each representing output halftone dot % values with respect to input halftone dot % values and having gradation changes which correspond to exposure levels in the process of exposing printing plates in contact with films to ultraviolet rays.

Specifically, the gradation conversion curves which have gradation changes corresponding to exposure levels are indicated respectively by titles "3rd step blank", "5th step blank", "7th step blank", and "8th step blank" that correspond to the respective exposure levels.

Usually, an amount of exposure to ultraviolet rays in producing a printing plate is controlled by applying density patches to the printing plate and determining up to which patch step the printing plate is left blank and from which patch step an image is produced on the printing plate. Density patches are divided in about 15 steps ranging from a highlight patch HL to a shadow patch SD in density incre-

ments or differences of 0.15, for example. The gradation conversion curve "3rd step blank" represents an amount of exposure such that a third density patch step is blank and fourth and following density patch steps carry a black image. The printing plates are of a positive type, and an area thereof which is subjected to an adequate amount of exposure is left blank. Similarly, the gradation conversion curve "5th step blank" represents an amount of exposure such that a fifth density patch step is blank and sixth and following density patch steps carry a black image. The amount of exposure of the gradation conversion curve "5th step blank" is twice the amount of exposure of the gradation conversion curve "3rd step blank". The gradation conversion curves "7th step blank", "8th step blank" represent respective amounts of exposure such that respective seventh and eighth density patch steps are blank. For positive-type printing plates, as the number of patch steps increases, a greater amount of exposure is applied and a greater blank area is produced, with halftone dot % decreasing.

In the example shown in FIG. 6, the mouse pointer MP is placed on the gradation conversion curve "3rd step blank" in the gradation conversion curve displaying area 52b. In the gradation conversion curve setting displaying area 54b, "3rd step blank" is displayed in all the gradation conversion curve setting boxes 61 - 64 associated with the color elements "Y", "M", "C", "K".

Since a desired gradation conversion curve can be se-

lected in the displayed view 50b shown in FIG. 6, the operator who is accustomed to the conventional contact exposure process for producing printing plates is allowed to select a desired gradation conversion curve highly simply based on the experience.

The gradation conversion curves having the gradation characteristics displayed in the gradation conversion curve setting displaying area 54b are saved as data in the gradation conversion curve saving unit 22. A gradation conversion curve selected by the gradation conversion curve selecting means 24 is read from the gradation conversion curve saving unit 22. In the gradation converting and binarizing device 12 shown in FIG. 2, the read gradation conversion curve is set in the LUT converter 26. In the gradation converting and binarizing device 12A shown in FIG. 5, the read gradation conversion curve is incorporated in the threshold data T, i.e., converts the threshold data T, stored in the threshold saving unit 28A.

By thus registering gradation conversion curves as curves corresponding to the conventional exposure levels, the operator who is accustomed to the conventional process of producing printing plates can perform a new process involving the CTP device 14 on the image outputting apparatus 10 using the image correcting know-how gained in the conventional process. Therefore, the image outputting apparatus 10 which operates based on digital data can smoothly be introduced into an environment based on the conventional skill

and experience.

The process of converting gradations using the gradation conversion curves displayed in the displayed views 50, 50a, 50b shown in FIGS. 3, 4, and 6 serves to convert all input gradations ranging from 0 % to 100 % into output gradations.

However, the gradation characteristics of gradation conversion curves that can be stored in the gradation conversion curve saving unit 22 are not limited to the conversion of all input gradations. As indicated by a displayed view 50c shown in FIG. 7, the gradation conversion curve saving unit 22 can store gradation conversion curves capable of independently converting the gradations in a highlight (HL) area, a middle-tone (MD) area, and a shadow (SD) area.

In the example shown in FIG. 7, seven gradation conversion curves "0", "+1", "+2", "+3", "-1", "-2", "-3" can be selected in the highlight area, five gradation conversion curves "0", "+1", "+3", "-1", "-3" can be selected in the middle-tone area, and five gradation conversion curves "0", "+1", "+2", "-1", "-2" can be selected in the shadow area.

The displayed view 50c shown in FIG. 7 has a gradation conversion curve displaying area 52c for displaying a plurality of gradation conversion curves for converting overall gradations, and a gradation conversion curve displaying area 52d for displaying a plurality of gradation conversion curves in each of the highlight area, the middle-tone area, and the shadow area.

The displayed view 50c also has a gradation conversion curve setting displaying area 54c for displaying settings of a gradation conversion curve selected from the gradation conversion curve displaying area 52c, including color elements "Y", "M", "C", "K", and gradation conversion curve setting boxes 61, 62, 63, 64 therefor.

The displayed view 50c further has a gradation conversion curve setting displaying area 54d for displaying settings of partial gradation conversion curves selected from the gradation conversion curve displaying area 52d.

The gradation conversion curve setting displaying area 54d comprises partial gradation conversion curve setting boxes 71, 72, 73 for the highlight area, the middle-tone area, and the shadow area relative to the color Y (Y printing plate), partial gradation conversion curve setting boxes 81, 82, 83 for the highlight area, the middle-tone area, and the shadow area relative to the color M (M printing plate), partial gradation conversion curve setting boxes 91, 92, 93 for the highlight area, the middle-tone area, and the shadow area relative to the color C (C printing plate), and partial gradation conversion curve setting boxes 101, 102, 103 for the highlight area, the middle-tone area, and the shadow area relative to the color K (K printing plate).

It can be seen from the settings displayed in the gradation conversion curve setting displaying area 54c and the gradation conversion curve setting displaying area 54d shown in FIG. 7 that an overall gradation conversion process is

performed to increase the volume of the magenta M by "+2", a partial gradation conversion process is performed to reduce the volume of the middle-tone area of the yellow Y by "-2", a partial gradation conversion process is performed to increase the volume of the highlight area of the cyan C, and no gradation conversion is effected on the color K.

The gradation converting and binarizing devices 12, 12A having the gradation conversion curve saving unit 22 for storing the gradation conversion curves displayed in the displayed view 50c shown in FIG. 7 are capable of independently converting overall gradations, and also capable of independently converting partial gradations in the highlight area, the middle-tone area, and the shadow area. In addition, the gradation converting and binarizing devices 12, 12A can convert a combination of overall gradations and partial gradations in the highlight area, the middle-tone area, and the shadow area.

According to another embodiment, when the image data G supplied to the gradation converting and binarizing devices 12, 12A comprises one page of image data G and the display unit 36 displays an image 105 shown in FIG. 8 (register marks and rules are omitted) based on binary image data H converted from the one page of image data by the binarizing unit 30 under the control of the processing/determining unit 32, the user may indicate the areas of a yellow plate image 110Y, a magenta plate image 110M, a cyan plate image 110C, and a black plate image 110K with the keyboard/mouse 34 and

the mouse pointer MP, and set desired gradation curves for each of the indicated areas according to the preference of the user.

The gradation conversion curve selecting means 24 also has a function to display the yellow plate image 110Y, the magenta plate image 110M, the cyan plate image 110C, and the black plate image 110K in superposed relation as a color image on the display unit 36.

The user can also set identical gradation conversion curves for the entire one-page image 105 with the keyboard/mouse 34 and the mouse pointer MP. If the image 105 shown in FIG. 8 is simultaneously displayed in the displayed view 50c shown in FIG. 7, the user can easily select gradation conversion curves.

According to still another embodiment, the gradation conversion curves stored in the gradation conversion curve saving unit 22 can be newly generated or corrected and then saved by the processing/determining unit 32 as follows:

The gradation conversion curve selecting means 24 shown in FIGS. 2 and 5 functions as a generating means for generating, or a correcting means for correcting, a plurality of gradation conversion curves whose gradation characteristics are different stepwise from each other.

While the gradation conversion curve saving unit 22 should preferably be present from the standpoint of the processing speed, it is not necessarily an indispensable component if there is a memory limitation in hardware. If

the gradation conversion curve saving unit 22 is omitted, then gradation conversion curves generated or corrected by the processing/determining unit 32 according suitable equations may be set directly in the LUT converter 26 or the threshold saving unit 28A. At this time, since the processing/determining unit 32 (in a wider meaning, the gradation conversion curve selecting means 24) serves as a means for setting gradation conversion curves in the LUT converter 26 or the threshold saving unit 28A, the processing/determining unit 32 functions as a preparing means for preparing a plurality of gradation conversion curves whose gradation characteristics are different stepwise from each other.

In the gradation converting and binarizing device 12A, gradation conversion curves generated (prepared) by the processing/determining unit (preparing means) 32 may be incorporated directly in the threshold data T stored in the threshold saving unit 28A.

In the gradation converting and binarizing devices 12, 12A, the respective threshold saving units 28, 28A may be omitted. If the respective threshold saving units 28, 28A are omitted, then the processing/determining unit 32 may be arranged to generate and correct thresholds.

A process of newly generating or correcting a plurality of gradation conversion curves to be stored in the gradation conversion curve saving unit 22 with the processing/determining unit 32 will be described below.

A control point/setting value display image (control

point/setting value display table) 121 shown in FIG. 9 is displayed on the display unit 36, and the user determines setting values (%) (1, 3, 8, 15, 40, 70, 80, 93, 97, 99, 100 in this example) corresponding to respective output vales (%) at respective control points (%) (1, 2, 5, 10, 30, 50, 70, 90, 95, 98, 99 in this example) corresponding to input values (%) determined in advance by the image outputting apparatus 10, and enters the determined setting values (%) with the keyboard/mouse 34.

In the example shown in FIG. 9, the values of the predetermined control points (%) are "1, 2, 5, 10, 30, 50, 70, 90, 95, 98, 99" representing finely divided points in the highlight and shadow areas and increments of 10 % in the middle-tone area, and the values of the entered setting values (%) are "1, 3, 8, 15, 40, 70, 80, 93, 97, 99, 100".

FIG. 10 shows an image 122 of a gradation conversion curve generating view which is displayed on the display unit 36 so as to correspond to the control point/setting value display image 121. In this embodiment, a gradation conversion curve 126 is generated (plotted) according to a least square approximation process effected on the setting values (%) "1, 3, 8, 15, 40, 70, 80, 93, 97, 99, 100". However, the gradation conversion curve 126 may be generated according to an nth-degree curve approximation process or a spline curve approximation process. A dotted-line gradation conversion curve 124 shown in FIG. 10 comprises a linear curve represented by $y = x$.

If the gradation conversion curve 126 is regarded as a gradation conversion curve with halftone dot % changed to a maximum, then a gradation conversion curve 128 (see FIG. 11) with halftone dot % changed to a minimum is generated according the same process as with the gradation conversion curve 126.

Then, the number of gradation conversion curves to be generated is set. If the number of gradation conversion curves to be generated is set to "4", then two gradation conversion curves 130, 132 that internally divide the generated gradation conversion curves 126, 128 are generated.

For correcting the gradation conversion curves 126, 128, 130, 132, the user may change setting values to be given to necessary control points in the control point/setting value display image 121 shown in FIG. 9.

In this manner, the gradation converting and binarizing device 12 (12A) is capable of newly generating and correcting a gradation conversion curve. A gradation conversion curve thus generated and corrected may be stored with a suitable file name in the gradation conversion curve saving unit 22.

For generating and correcting the gradation conversion curve 126 with the GUI, the user holds a desired point on an existing gradation conversion curve, such as a linear gradation conversion curve 140 shown in FIG. 12, displayed on the display unit 36 with the mouse pointer MP using the keyboard/mouse 34, and drags the held point to a desired grada-

tion conversion position indicated by "×".

At this time, as shown in FIG. 13, the processing/determining unit 32 automatically generates a gradation conversion curve 142 that passes through the point dragged by the keyboard/mouse 34.

If the gradation conversion curve 142 thus generated is regarded as a gradation conversion curve with halftone dot % changed to a maximum, then a gradation conversion curve with halftone dot % changed to a minimum is generated according the same process as with the gradation conversion curve shown in FIG. 11.

Then, the number of gradation conversion curves to be generated is set. If the number of gradation conversion curves to be generated is set to "4", then two gradation conversion curves that internally divide the generated gradation conversion curves are generated. In this fashion, desired gradation conversion curves are generated or corrected.

In the above embodiment, when printing plates PP are to generated from the C, M, Y, K image data G by the image outputting apparatus 10, in a preparing process in step S1, a plurality of gradation conversion curves whose gradation characteristics are different stepwise from each other are prepared and displayed on the display unit 36. Alternatively, as described above, gradation conversion curves generated and stored in the gradation conversion curve saving unit 22 may be used, or gradation conversion curves may be

newly generated by the processing/determining unit 32.

In a selecting process in step S2, the user selects a desired gradation conversion curve from the gradation conversion curves displayed on the display unit 36 using the keyboard/mouse 34. The selected gradation conversion curve is set in the LUT converter 26 or the threshold saving unit 28A.

In a gradation converting and binarizing process in step S3, the LUT converter 26 converts the gradations of C, M, Y, K image data G, and thereafter the binarizing unit 30 binarizes the gradation-converted C, M, Y, K image data G (see FIG. 2). Alternatively, the binarizing unit 30 converts the gradations of C, M, Y, K image data G and binarizes the gradation-converted C, M, Y, K image data G (see FIG. 5).

Finally, in an outputting process in step S4, the CTP device 14 generates and outputs printing plates PP from binary image data H generated in step S3.

In this manner, the image outputting apparatus 10 can correct the hues of an image, i.e., correct the gradations of printing plates, in the process of producing the printing plates without going back to a prior process.

According to the present invention, as described above, hue adjustments, which cannot be sufficiently be achieved by adjusting the amounts of inks in the printing process, can easily be performed in the image outputting apparatus which is capable of generating at least one of a print, a print

proof, a printing plate, and a platemaking film directly from digital image data including one or more color elements.

The image outputting apparatus can correct gradations simply and flexibly to achieve a color match between the hues and the colors of a print sample under different conditions, i.e., when a different printing press is used, or a different printing plate material is used, a different ink or print paper is used, or printing plate materials, inks, and print papers differ from lot to lot.

Furthermore, gradations in a partial density area (the highlight, middle-tone, or shadow area or a combination thereof), which have heretofore been difficult to correct by adjusting exposure levels in the conventional contact exposure process, can easily be corrected.

Inasmuch as each of a plurality of gradation conversion curves has gradation changes which correspond to exposure levels in the process of exposing printing plates in contact with films to ultraviolet rays, the operator can perform a new process involving the CTP device or the like on the image outputting apparatus using the image correcting know-how gained in the conventional process. Therefore, an apparatus such as a plate setter or the like can smoothly be introduced into the recent printing process based on digital image data.

Although certain preferred embodiments of the present invention have been shown and described in detail, it should

be understood that various changes and modifications may be made therein without departing from the scope of the appended claims.

What is claimed is:

1. An apparatus for outputting an image by generating at least one of a print, a print proof, a printing plate, and a platemaking film directly from image data including at least one color element, comprising:

preparing means for preparing a plurality of gradation conversion curves whose gradation characteristics are different stepwise from each other;

selecting means for selecting one of said gradation conversion curves with respect to at least one color element; and

gradation converting means for being supplied with image data, converting gradations of the supplied image data according to the selected gradation conversion curve, and outputting image data represented by the image data with the corrected gradations.

2. An apparatus according to claim 1, wherein said preparing means comprises storing means for storing the gradation conversion curves whose gradation characteristics are different stepwise from each other.

3. An apparatus according to claim 1, wherein said preparing means comprises generating means for generating the gradation conversion curves whose gradation characteristics are different stepwise from each other.

4. An apparatus according to claim 1, wherein each of said gradation conversion curves has gradation changes which correspond to exposure levels in a contact exposure process for producing printing plates.

5. An apparatus according to claim 4, wherein each of said gradation conversion curves which has the gradation changes which correspond to said exposure levels is indicated by a title corresponding to one of the exposure levels.

6. An apparatus according to claim 1, wherein said gradation conversion curves whose gradation characteristics are different stepwise from each other comprise a plurality of gradation conversion curves whose gradation characteristics are different stepwise from each other only in a highlight area, a middle-tone area, or a shadow area.

7. An apparatus according to claim 2, further comprising:

gradation conversion curve generating/correcting means for newly generating or correcting said gradation conversion curves.

8. An apparatus according to claim 1, further comprising:

display means for simultaneously displaying said grada-

tion conversion curves.

9. A method of outputting an image by generating at least one of a print, a print proof, a printing plate, and a platemaking film directly from image data including at least one color element, comprising the steps of:

preparing a plurality of gradation conversion curves whose gradation characteristics are different stepwise from each other;

selecting one of said gradation conversion curves with respect to at least one color element; and

converting gradations of supplied image data according to the selected gradation conversion curve, and outputting image data represented by the image data with the corrected gradations.

10. A method according to claim 9, wherein said step of preparing comprises the step of:

storing the gradation conversion curves whose gradation characteristics are different stepwise from each other.

11. A method according to claim 9, wherein said step of preparing comprises the step of:

generating the gradation conversion curves whose gradation characteristics are different stepwise from each other.

12. A method according to claim 9, wherein each of said

gradation conversion curves has gradation changes which correspond to exposure levels in a contact exposure process for producing printing plates.

13. A method according to claim 12, wherein each of said gradation conversion curves which has the gradation changes which correspond to said exposure levels is indicated by a title corresponding to one of the exposure levels.

14. A method according to claim 9, wherein said gradation conversion curves whose gradation characteristics are different stepwise from each other comprise a plurality of gradation conversion curves whose gradation characteristics are different stepwise from each other only in a highlight area, a middle-tone area, or a shadow area.

ABSTRACT OF THE DISCLOSURE

In a digital printing process employing a CTP device 14, hues can easily be changed in a process of generating printing plates without going back to a prior process. A plurality of gradation conversion curves whose gradation characteristics are different stepwise from each other, which are stored in a gradation conversion curve saving unit 22, are displayed on a display unit 36. The user selects a desired of the displayed gradation conversion curves with respect to at least one color element with a keyboard/mouse 34. The selected gradation conversion curve is set in an LUT converter 26. Input image data G can easily be converted into output image data Ga by converting the gradations of the input image data G according to the gradation conversion curve set in the LUT converter 26. The image data Ga is converted by a binarizing unit 30 into binary image data H, which is supplied to the CTP device 14. The CTP device 14 outputs printing plates each bearing a binary image represented by the binary image data H.

FIG. 1

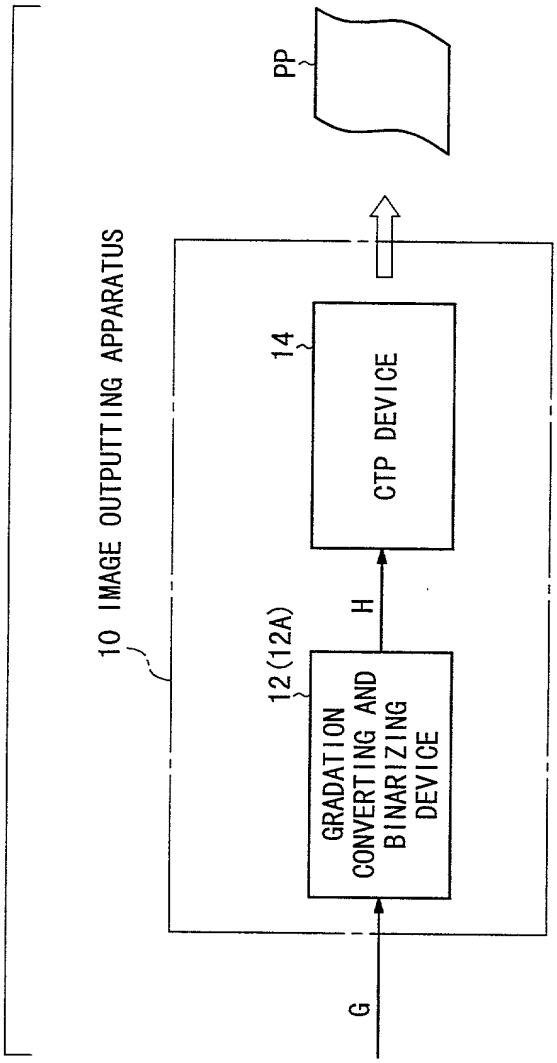

10 IMAGE OUTPUTTING APPARATUS
12(12A)
GRADATION CONVERTING AND BINARIZING DEVICE
H
14
CTP DEVICE
G
PP

FIG. 2

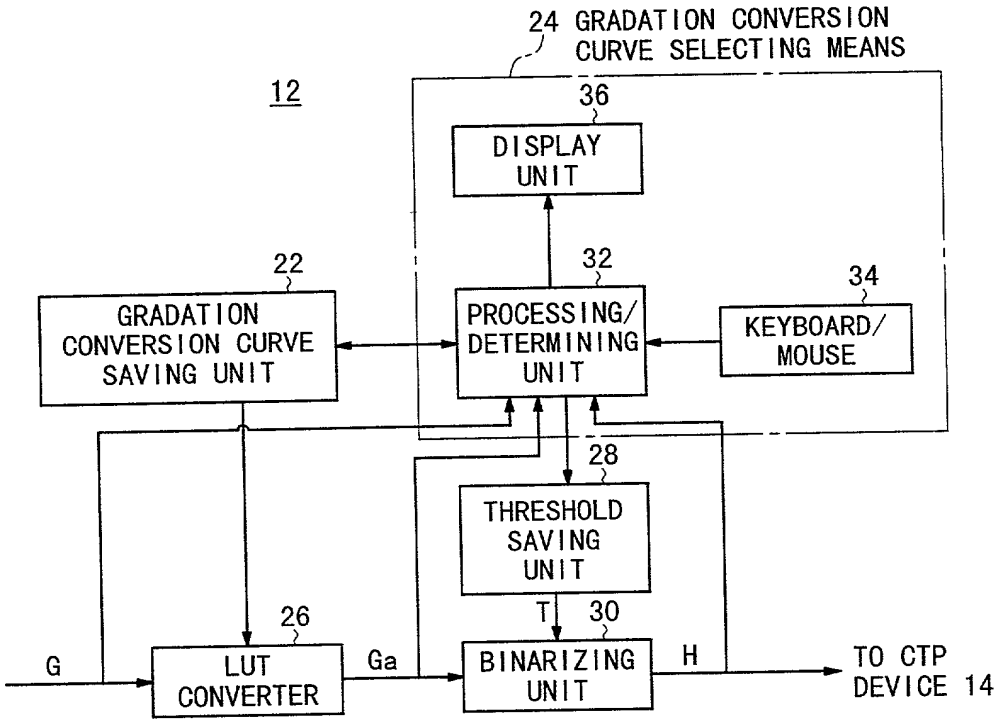

24 GRADATION CONVERSION CURVE SELECTING MEANS
12
36
DISPLAY UNIT
22
32
34
GRADATION CONVERSION CURVE SAVING UNIT
PROCESSING/ DETERMINING UNIT
KEYBOARD/ MOUSE
28
THRESHOLD SAVING UNIT
T
30
26
G
LUT CONVERTER
Ga
BINARIZING UNIT
H
TO CTP DEVICE 14

FIG. 3

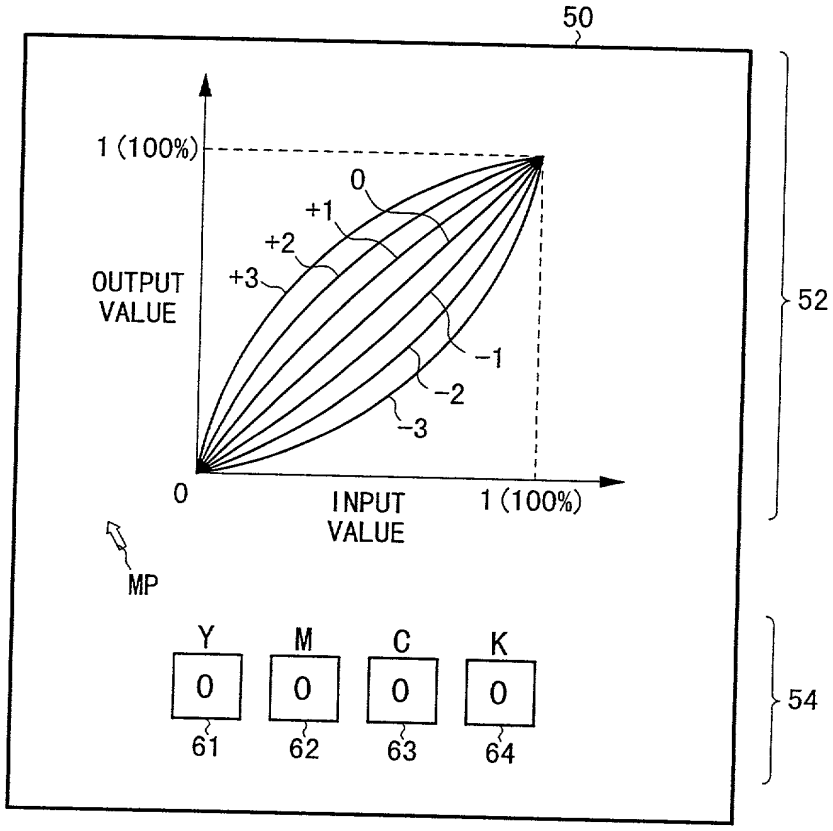

50
1 (100%)
0
+1
+2
+3
OUTPUT VALUE
-1
-2
-3
0
INPUT VALUE
1 (100%)
52
MP
Y
M
C
K
0
0
0
0
61
62
63
64
54

FIG. 4

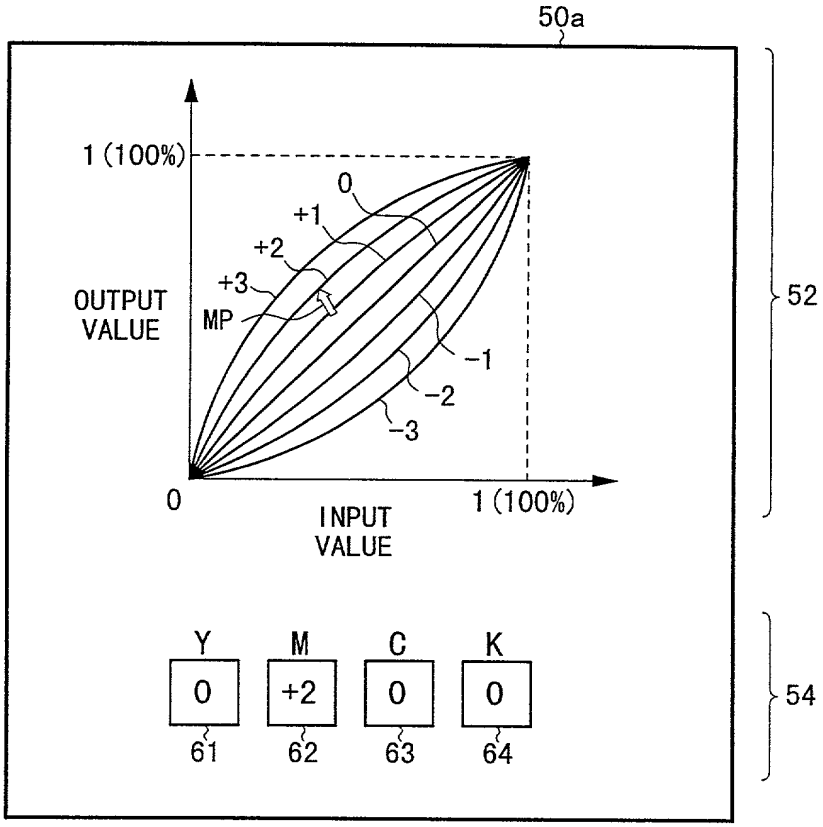

50a
1 (100%)
0
+1
+2
+3
MP
OUTPUT VALUE
−1
−2
−3
0
1 (100%)
INPUT VALUE
52
Y
M
C
K
0
+2
0
0
61
62
63
64
54

FIG. 5

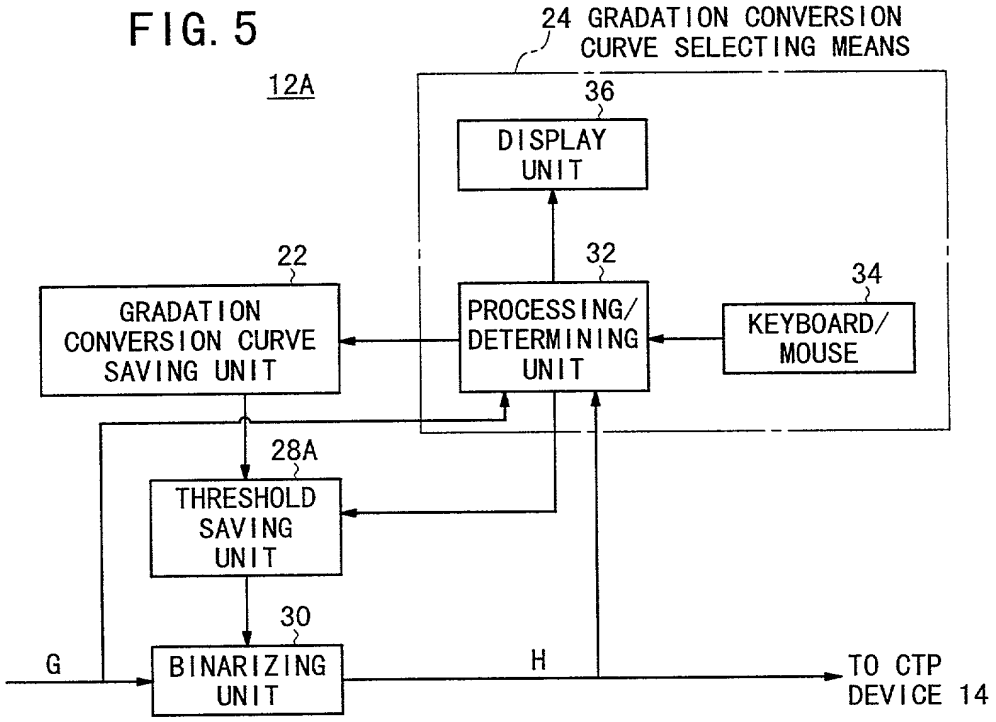

24 GRADATION CONVERSION CURVE SELECTING MEANS
12A
36
DISPLAY UNIT
22
32
34
GRADATION CONVERSION CURVE SAVING UNIT
PROCESSING/ DETERMINING UNIT
KEYBOARD/ MOUSE
28A
THRESHOLD SAVING UNIT
30
G
BINARIZING UNIT
H
TO CTP DEVICE 14

FIG. 6

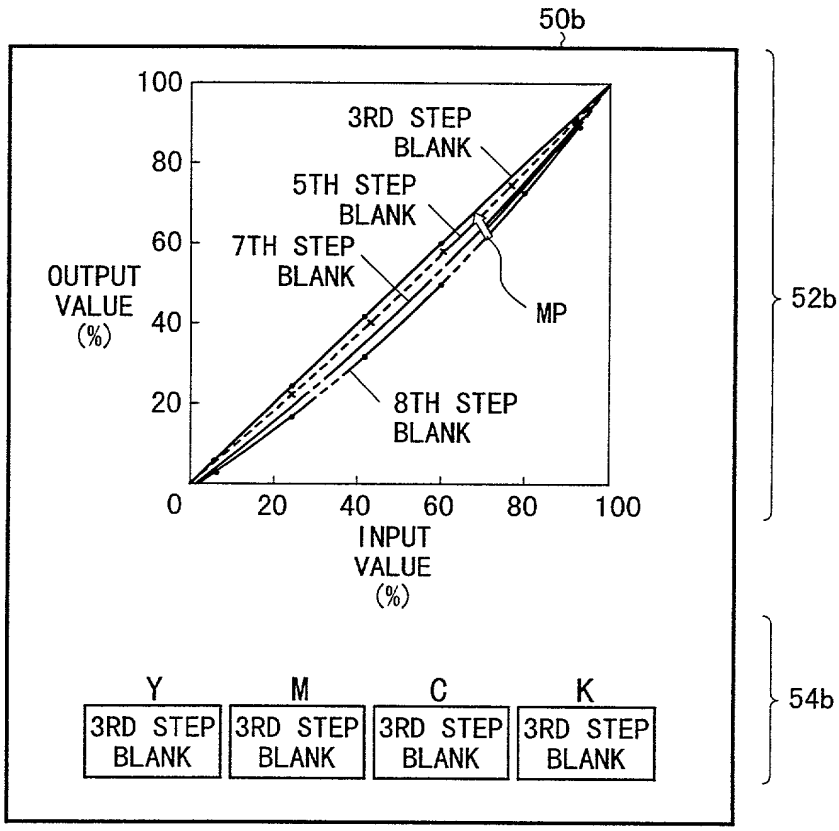

50b
100
80
60
40
20
0
20
40
60
80
100
OUTPUT VALUE (%)
INPUT VALUE (%)
3RD STEP BLANK
5TH STEP BLANK
7TH STEP BLANK
8TH STEP BLANK
MP
52b
Y
M
C
K
3RD STEP BLANK
3RD STEP BLANK
3RD STEP BLANK
3RD STEP BLANK
54b

FIG. 7

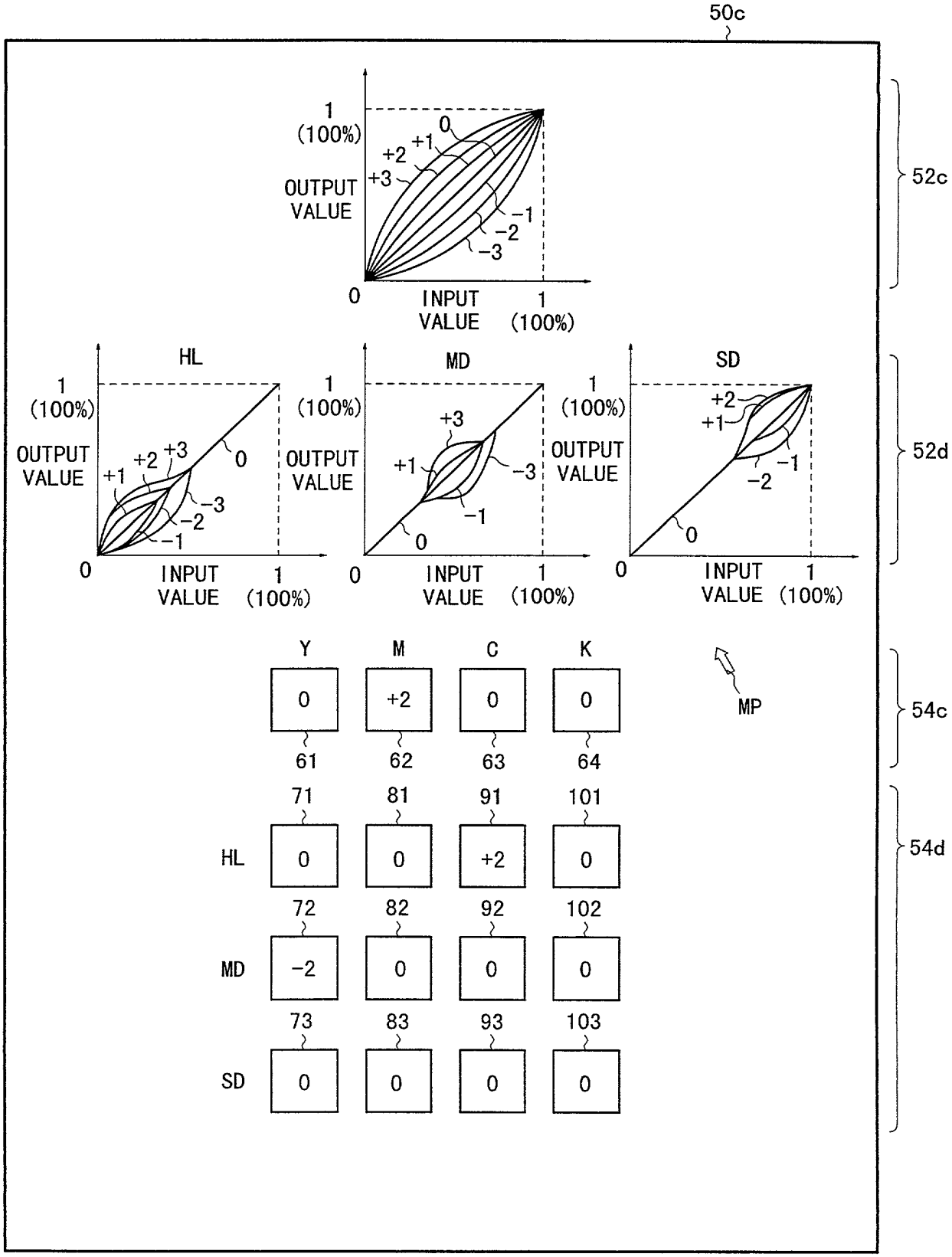

50c
1
(100%)
OUTPUT
VALUE
0
+1
+2
+3
-1
-2
-3
0
INPUT
VALUE
1
(100%)
52c
HL
MD
SD
52d
Y
M
C
K
0
+2
0
0
61
62
63
64
MP
54c
71
81
91
101
HL
0
0
+2
0
72
82
92
102
MD
-2
0
0
0
73
83
93
103
SD
0
0
0
0
54d

FIG. 8

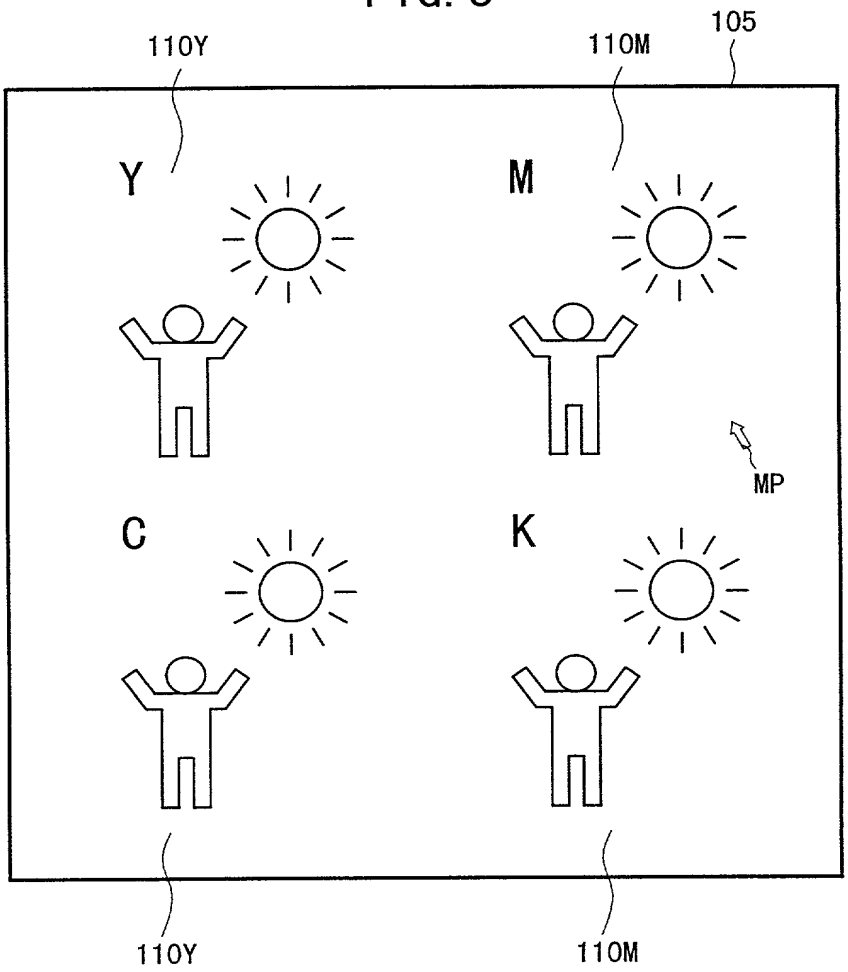


FIG. 9

121

CONTROL POINT	1	2	5	10	30	50	70	90	95	98	99
SETTING VALUE	1	3	8	15	40	70	80	93	97	99	100

FIG. 10

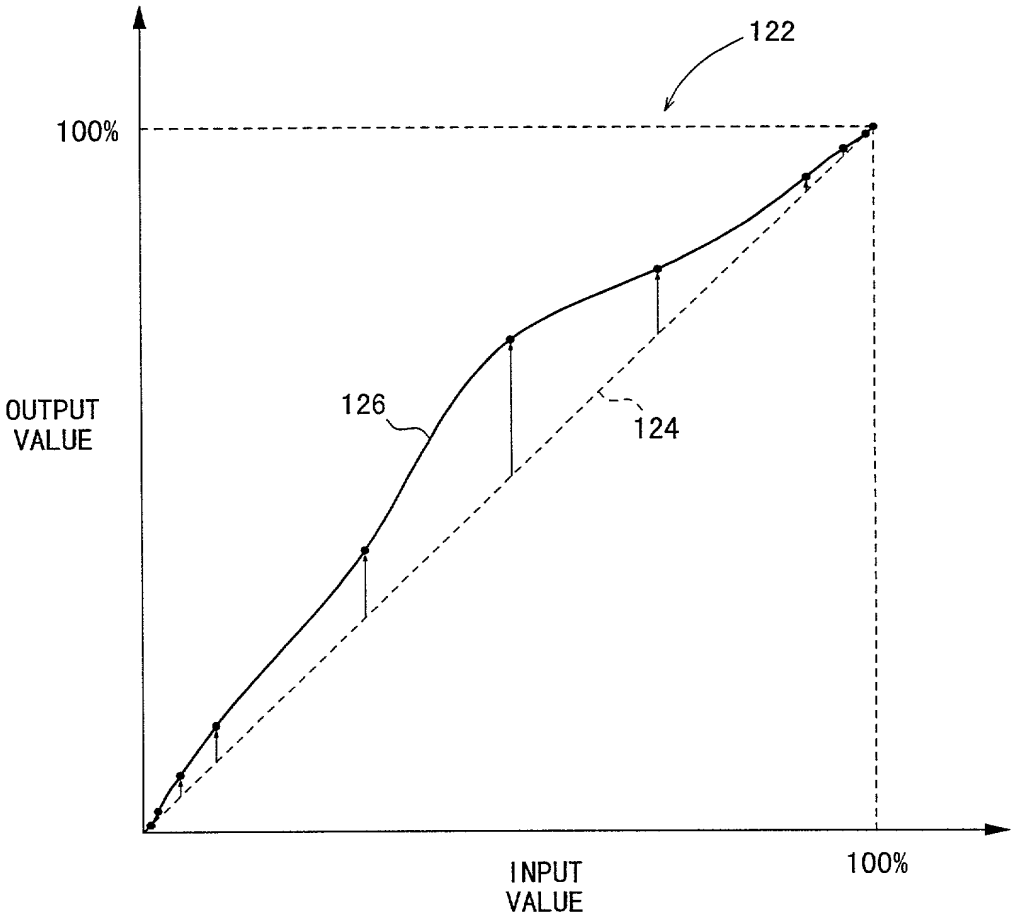


FIG. 11

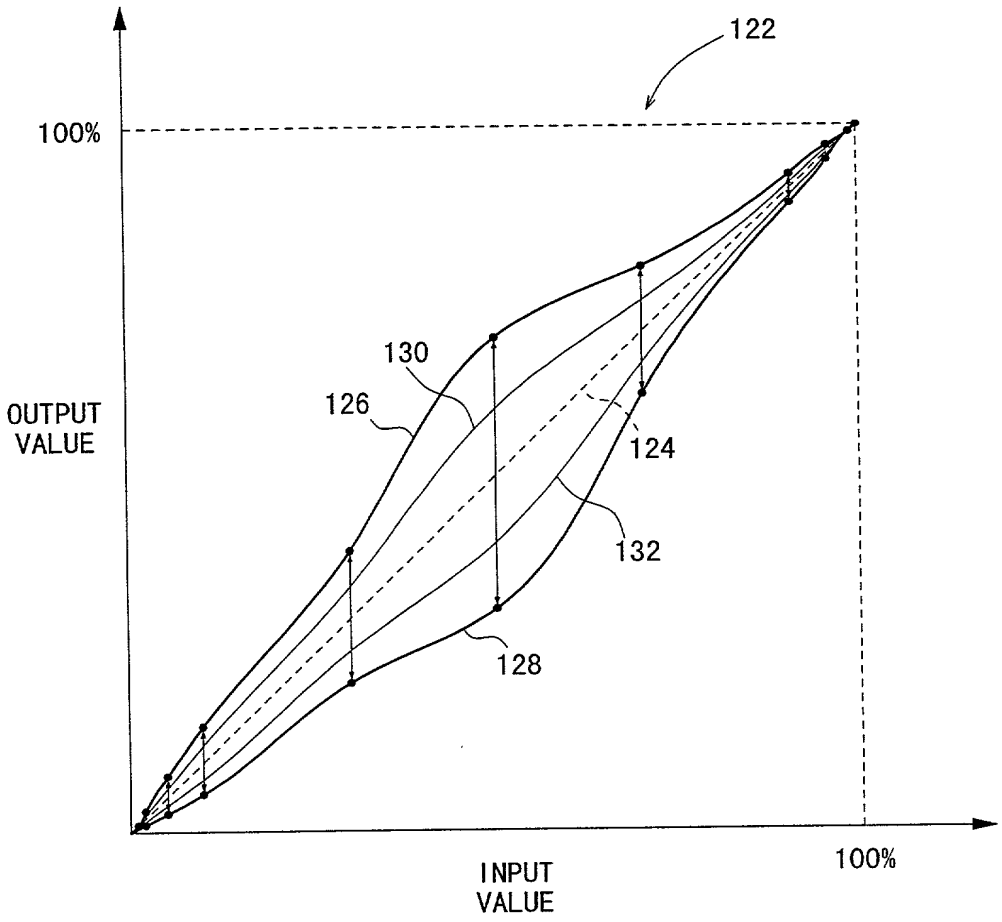


FIG. 12

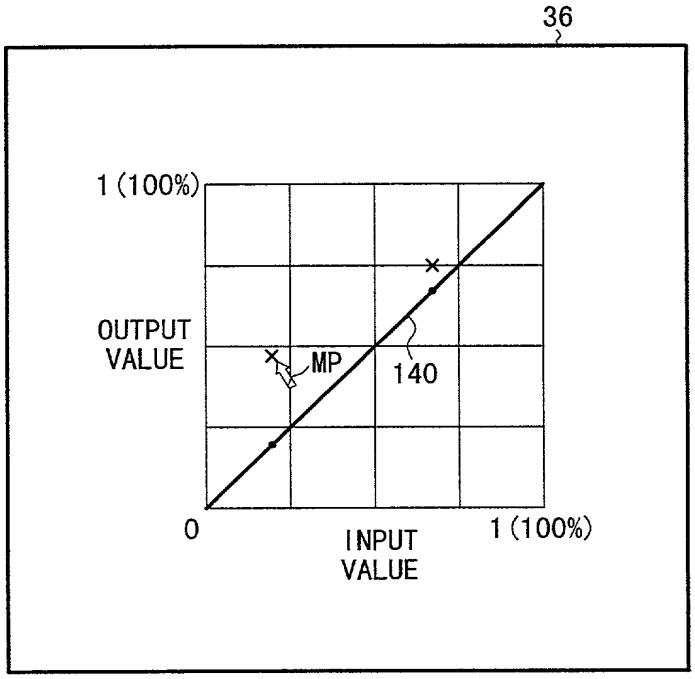


FIG. 13

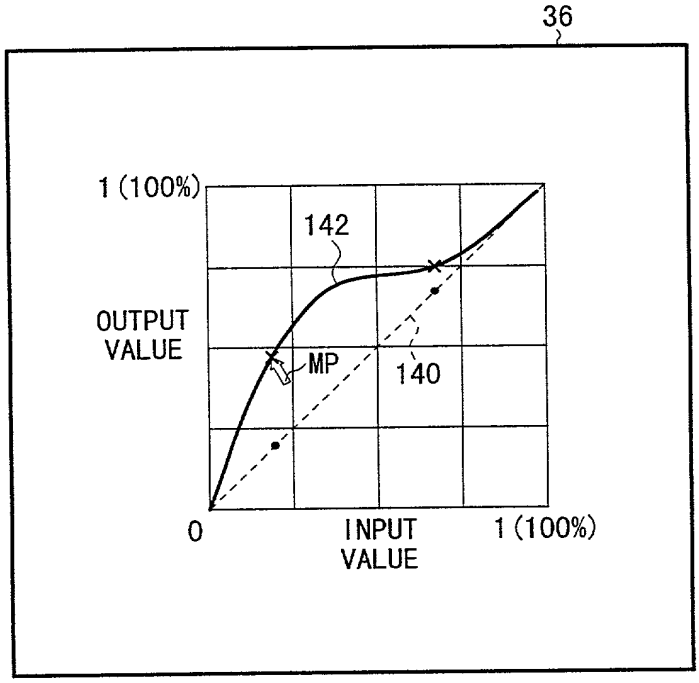
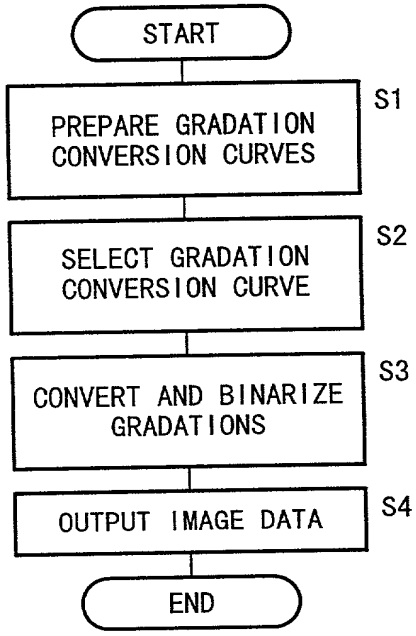


FIG. 14


START
PREPARE GRADATION CONVERSION CURVES
S1
SELECT GRADATION CONVERSION CURVE
S2
CONVERT AND BINARIZE GRADATIONS
S3
OUTPUT IMAGE DATA
S4
END

Declaration and Power of Attorney for Patent Application

特許出願宣言書及び委任状

Japanese Language Declaration

日本語宣言書

下記の氏名の発明者として、私は以下の通り宣言します。

As a below named inventor, I hereby declare that:

私の住所、私書箱、国籍は下記の私の氏名の後に記載された通りです。

My residence, post office address and citizenship are as stated next to my name,

下記の名称の発明に関して請求範囲に記載され、特許出願している発明内容について、私が最初かつ唯一の発明者（下記の氏名が一つの場合）もしくは最初かつ共同発明者であると（下記の名称が複数の場合）信じています。

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

APPARATUS FOR AND METHOD OF

OUTPUTTING IMAGE

上記発明の明細書（下記の欄でX印がついていない場合は、本書に添付）は、

the specification of which is attached hereto unless the following box is checked:

☐ ___月___日に提出され、米国出願番号または特許協定条約

国際出願番号を _____ とし、

（該当する場合）_____ に訂正されました。

☐ was filed on _____
as United States Application Number or
PCT International Application Number

_____ and was amended on

_____ (if applicable).

私は、特許請求範囲を含む上記訂正後の明細書を検討し、内容を理解していることをここに表明します。

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

私は、連邦規則法典第37編第1条56項に定義されるとおり、特許資格の有無について重要な情報を開示する義務があることを認めます。

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56.

Japanese Language Declaration
(日本語宣言書)

私は、米国法典第35編第119条(a)-(d)項又は第365条(b)項に基き下記の、米国以外の国の少なくとも一カ国を指定している特許協力条約第365条(a)項に基づく国際出願、又は外国での特許出願もしくは発明者証の出願についての外国優先権をここに主張するとともに、優先権を主張している本出願の前に出願された特許または発明者証の外国出願を以下に、枠内をマークすることで、示しています。

I hereby claim foreign priority under Title 35, United States Code, Section 119(a)-(d) or 365(b) of any foreign application(s) for patent or inventor's certificate, or 365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or PCT International application having a filing date before that of the application on which priority is claimed.

Prior Foreign Applications 外国での先行出願			Priority Not Claimed 優先権主張なし
Patent Application No. 11-292086 (Number) (番号)	Japan (Country) (国名)	14 October 1999 (Day/Month/Year Filed) (出願年月日)	☐
Patent Application No. 2000-296761 (Number) (番号)	Japan (Country) (国名)	September 28, 2000 (Day/Month/Year Filed) (出願年月日)	☒
(Number) (番号)	(Country) (国名)	(Day/Month/Year Filed) (出願年月日)	☐

私は、第35編米国法典119条(e)項に基づいて下記の米国特許出願規定に記載された権利をここに主張致します。

I hereby claim the benefit under Title 35, United States Code, Section 119(e) of any United States provisional application(s) listed below.

(Application No.) (出願番号)	(Filing Date) (出願日)	(Application No.) (出願番号)	(Filing Date) (出願日)

私は、下記の米国法典第35編第120条に基づいて下記の米国特許出願に記載された権利、又は米国を指定している特許協力条約第365条(c)に基づく権利をここに主張します。又、本出願の各請求範囲の内容が米国法典第35編第112条第1項又は特許協力条約で規定された方法で先行する米国特許出願に開示されていない限り、その先行米国出願書提出日以降で本出願書の日本国内又は特許協力条約国際出願提出日までの期間中に入手された、連邦規則法典第37編第1条第56項で定義された特許資格の有無に関する重要な情報について開示義務があることを認識しています。

I hereby claim the benefit of Title 35, United States Code Section 120 of any United States application(s), or 365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of Title 35, United States Code Section 112, I acknowledge the duty to disclose any material information which is material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application:

(Application No.) (出願番号)	(Filing Date) (出願日)	(Status: Patented, Pending, Abandoned) (現況: 特許許可済、係属中、放棄済)
(Application No.) (出願番号)	(Filing Date) (出願日)	(Status: Patented, Pending, Abandoned) (現況: 特許許可済、係属中、放棄済)

私は、私自身の知識に基づいて本宣言中で私が行う表明が真実であり、かつ私の入手した情報と私の信ずるところに基づく表明が全て真実であると信じていること、さらに故意になされた虚偽の表明及びそれと同等の行為は米国法典第18編第1001条に基づき、罰金または拘禁、もしくはその両方により処罰されること、そしてそのような故意による虚偽の声明を行えば、出願した、又は既に許可された特許の有効性が失われることを認識し、よってここに上記のごとく宣誓を致します。

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Japanese Language Declaration

(日本語宣言書)

委任状：私は、下記の発明者として、本出願に関する一切の手続きを米国特許商標局に対して遂行する弁理士又は代理人として、下記のものを指名致します。(弁護士、又は代理人の氏名及び登録番号を明記のこと)

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith *(list name and registration number)*

John H. Mion, Reg. No. 18,879; Thomas J. Macpeak, Reg. No. 19,292; Robert J. Seas, Jr., Reg. No. 21,092; Darryl Mexic, Reg. No. 23,063; Robert V. Sloan, Reg. No. 22,775; Peter D. Olexy, Reg. No. 24,513; J. Frank Osha, Reg. No. 24,625; Waddell A. Biggart, Reg. No. 24,861; Louis Gubinsky, Reg. No. 24,835; Neil B. Siegel, Reg. No. 25,200; David J. Cushing, Reg. No. 28,703; John R. Inge, Reg. No. 26,916; Joseph J. Ruch, Jr., Reg. No. 26,577; Sheldon I. Landsman, Reg. No. 25,430; Richard C. Turner, Reg. No. 29,710; Howard L. Bernstein, Reg. No. 25,665; Alan J. Kasper, Reg. No. 25,426; Kenneth J. Burchfiel, Reg. No. 31,333; Gordon Kit, Reg. No. 30,764; Susan J. Mack, Reg. No. 30,951; Frank L. Bernstein, Reg. No. 31,484; Mark Boland, Reg. No. 32,197; William H. Mandir, Reg. No. 32,156; Brian W. Hannon, Reg. No. 32,778; Abraham J. Rosner, Reg. No. 33,276; Bruce E. Kramer, Reg. No. 33,725; Paul F. Neils, Reg. No. 33,102; Brett S. Sylvester, Reg. No. 32,765; Robert M. Masters, Reg. No. 35,603, and George F. Lehnigk, Reg. No. 36,359

書類送付先：

Send Correspondence to:

SUGHRUE, MION, ZINN, MACPEAK & SEAS, PLLC
2100 Pennsylvania Avenue, N.W., Washington, D.C. 20037-3213

直通電話連絡先：(名称及び電話番号)

Direct Telephone Calls to: ***(name and telephone number)***

(202)293-7060

唯一又は第一発明者名	Full name of sole or first inventor Yoshiaki INOUE
発明者の署名 日付	Inventor's signature Date Yoshiaki Inoue Oct. 3, 2000
住所	Residence Odawara-shi, Kanagawa-ken, JAPAN
国籍	Citizenship Japan
郵便の宛先	Post office address c/o Fuji Photo Film Co., Ltd., 798 Miyanodai,
	Kaisei-machi, Ashigarakami-gun, Kanagawa-ken 258-8538, Japan
第二共同発明者名(該当する場合)	Full name of second joint inventor, if any
第二発明者の署名 日付	Second inventor's signature Date
住所	Residence
国籍	Citizenship
郵便の宛先	Post office address

(第三以降の共同発明者についても同様に記載し、署名をすること。)

(Supply similar information and signature for third and subsequent joint inventors.)